



The ENSEMBLES Downscaling Portal

A user-friendly GRID based tool for GCM
post-processing and downscaling

The screenshot shows the 'Portal for reanalysis data access and statistical downscaling' interface. At the top, there are tabs for Home, Registration, Data access, and Downscaling. Below the tabs, there's a banner for the 'Web portal for statistical downscaling' from the 'Applied Meteorology Group (NM & UC) Santander'. The main content area has a heading 'Web portal for reanalysis data access and statistical downscaling'. It explains the project's aim of maximizing the exploitation of ensemble prediction results for various applications. It also states that the portal provides user-friendly web access to statistical downscaling techniques and simulations produced by ENSEMBLES. A section titled 'Three steps are necessary to obtain high resolution forecasts in a region of interest: 1. Selecting the predictors, 2. Selecting the stations and variable, 3. Running the desired downscaling jobs.' is present. Below this, there are two maps: one showing a regional view with a green grid overlay, and another showing a larger map of Europe with a specific region highlighted. Various dropdown menus and input fields for 'Data bases', 'Variable', 'Project', and 'Data Base' are visible.

Antonio S. Cofiño

D. San-Martín, J.M. Gutiérrez, C. Sordo, J. Fernández, D. Frías, M.A. Rodríguez, S. Herrera, R. Ancell, M. Pons, B. Orfila, E. Díez

**Santander
Meteorology
Group**



predictia
INTELLIGENT DATA SOLUTIONS

Motivation

There are many projects around the world producing global (GCM) and regional (RCM) simulations of climate change.



The ENSEMBLES project (contract number GOCE-CT-2003-505539) is supported by the European Commission's 6th Framework Programme as a 5 year Integrated Project from 2004-2009 under the Thematic Sub-Priority "Global Change and Ecosystems".

Many of these projects involve end-uses from impact sectors ...

The project aims to:

- Maximise the exploitation of the results by linking the outputs of the ensemble prediction system to a range of applications, including agriculture, health, food security, energy, water resources, insurance and weather risk management

However, it is still difficult for end-users to access the stored simulations and to post-process them to be suitable for their own models: daily resolution, interpolation to prescribed locations, etc.

*There is a need of **friendly interactive tools** so users can easily run interpolation/downscaling jobs on their own data using the existing downscaling techniques and simulation datasets (AR4, Prudence, ENSEMBLES, ...).*

www.meteo.unican.es/ensembles

Portal for reanalysis data access and statistical downscaling - Mozilla Firefox

Archivo Editar Ver Ir Marcadores Herramientas Ayuda

http://www.meteo.unican.es/ensembles/ Ir G

Home Registration Data access Downscaling

Web portal for statistical downscaling
Applied Meteorology Group (INM & UC)
Santander

ENSEMBLES

Web portal for reanalysis data access and statistical downscaling

One of the Ensemble's project aims is maximizing the exploitation of the results by linking the outputs of the ensemble prediction system to a range of applications, including agriculture, health, food security, energy, water resources, insurance and weather risk management, which use high resolution climate inputs to feed their models. To cover the gap between the global coarse simulations and the regional high-resolution needs, downscaling techniques are required, both dynamical and statistical.

→ This portal provides *user-friendly web access to statistical downscaling techniques and simulations (global and regional model outputs) produced in ENSEMBLES.*

Three steps are necessary to obtain high resolution forecasts in a region of interest: 1. Selecting the predictors, 2. Selecting the stations and variable, 3. Running the desired downscaling jobs.

Predictors Predictand Downscale

Zone name: JRC_1.0

Web portal for statistical downscaling
Applied Meteorology Group
(INM & University of Cantabria)

Data bases: JRC Data details

Variable: mean daily rainfall (mm)

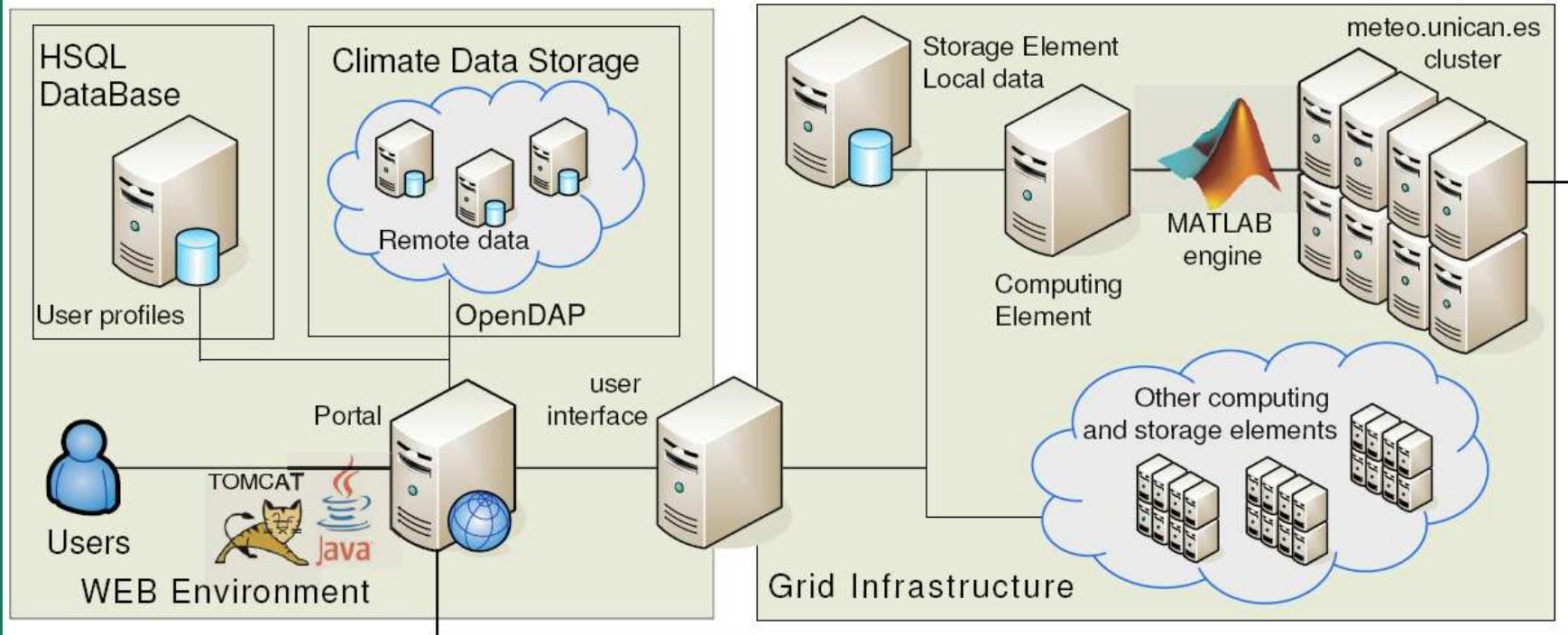
Predictors Predictand Downscale

Project: DEMETER Data Base: JRC

legend January February March April May
lead month: 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1
start 1958
scwrf

GRID Computing Infrastructure

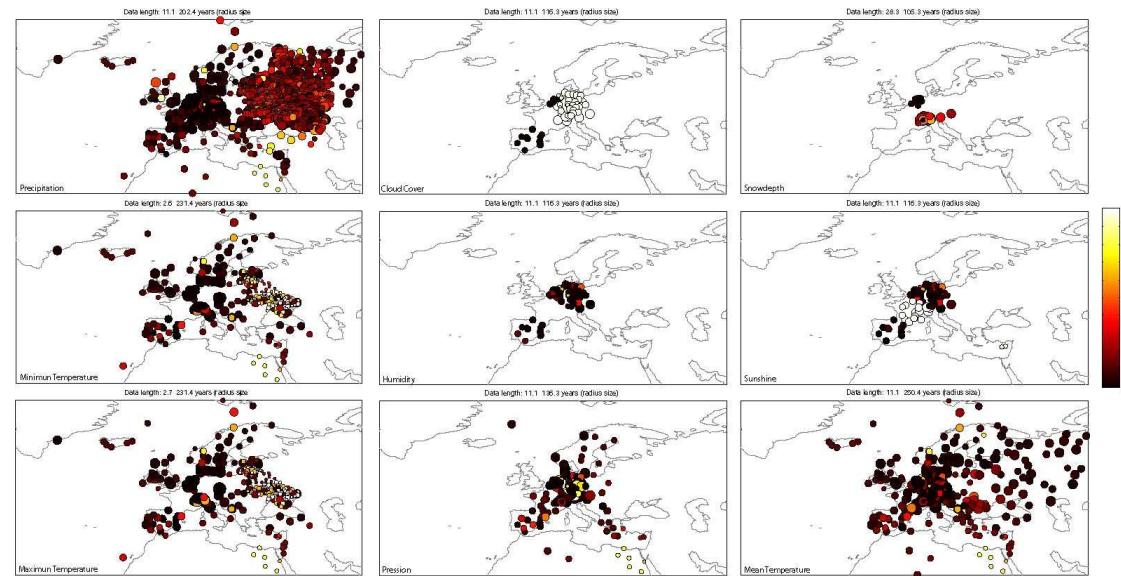
- Jobs submission based on gLite middleware.
- A lot of ongoing work for GRID integration making the end-user life easier.



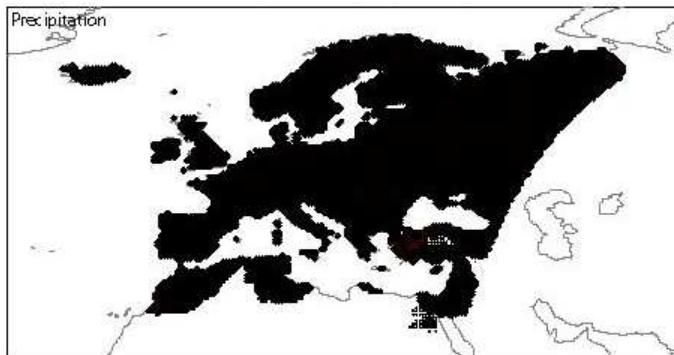
- The EGEE project it is negotiating the license schema for using MATLAB in EGEE's sites.
- Currently we are handling locally 10TB of data from models and observations.

Data Availability. Observations

- **ECA** (European Climate Assessment & Dataset project). Daily datasets of precipitation, temperature, pressure, humidity, cloud cover, sunshine and snow depth since 1900 over networks of 100-1000 stations.



- **Ensembles 50km gridded daily observation records** of precipitation and surface temperature. 1950-2006.



Data Availability. GCMs

- Minimum set of variables for each model:

Variable (Code)	Levels	Time
Geopotential (Z)	yes	00-12
V velocity (V)	yes	00-12
U velocity (U)	yes	00-12
Temperature (T)	yes	00-12
Relative humidity (R)	yes	00-12
Specific humidity (Q)	yes	00-12
Potential Vorticity (PV)	yes	00-12
Relative Vorticity (VO)	yes	00-12
Divergence (D)	yes	00-12
MSLP (MSL)	no	
2m Temperature (2T)	no	
Minimum Temperature (Tn)	no	
Maximum Temperature (Tx)	no	
10m E-Wind Component (10U)	no	
10m N-Wind Component (10V)	no	
Total Precipitation (PR)	no	

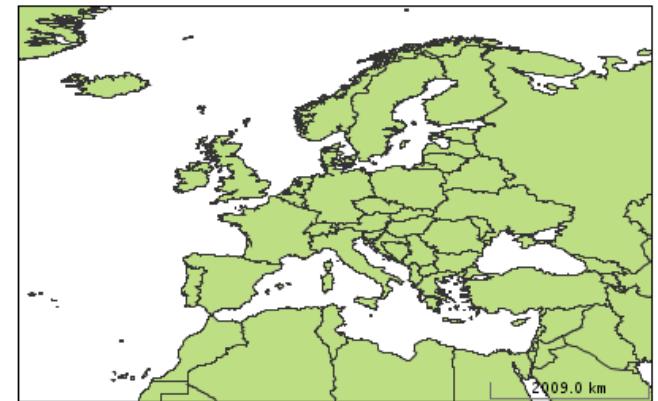
- Not always possible due limitations in model data availability

Data Availability. Reanalysis & S2D

Data available for the European region:

- **NCEP/NCAR** Reanalysis1. 1948-2007
- **ERA40** ECMWF: 1957-2002
- **JRA25** Japanese Reanalysis: 1979-2004

A smaller worldwide dataset is also available



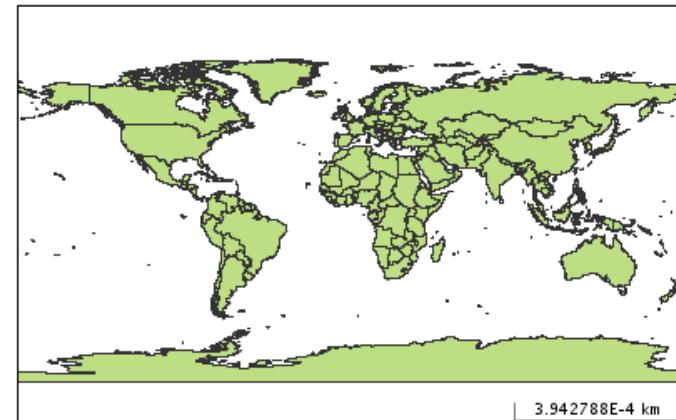
Available for Europe

- **DEMETER**. Multi-model seasonal prediction experiment including seven models ran for six months four times a year using 9 different perturbed initial conditions (9 members).
- **ENSEMBLES** Stream 2 Seasonal Hindcast, using OPeNDAP:
<http://ensembles.ecmwf.int/thredds>

Data Availability. ACC

Daily global datasets obtained from different sources:

- CERA
- IPCC data centre (*PCMDI*)
- Local Providers.



- **PCMDI_CGCM3.** Canadian Centre for Climate Modelling and Analysis, including **20th century** (from 1951 to 2000) and scenarios **A1B**, **B1** (periods 2046-2065 and 2081-2100).
- **CERA_MPI-ECHAM5**, including **20th century** data (1961-2000) and scenarios **A1B**, **B1**, and **A2** (2001-2100).
- **CNRM-CM3 (local provider)**, including **20th century** (1961-2000) and scenarios **A1B**, **B1**, and **A2** (2001-2100).

We will continue including datasets as they become available and demanded by user.

Data Access Portal

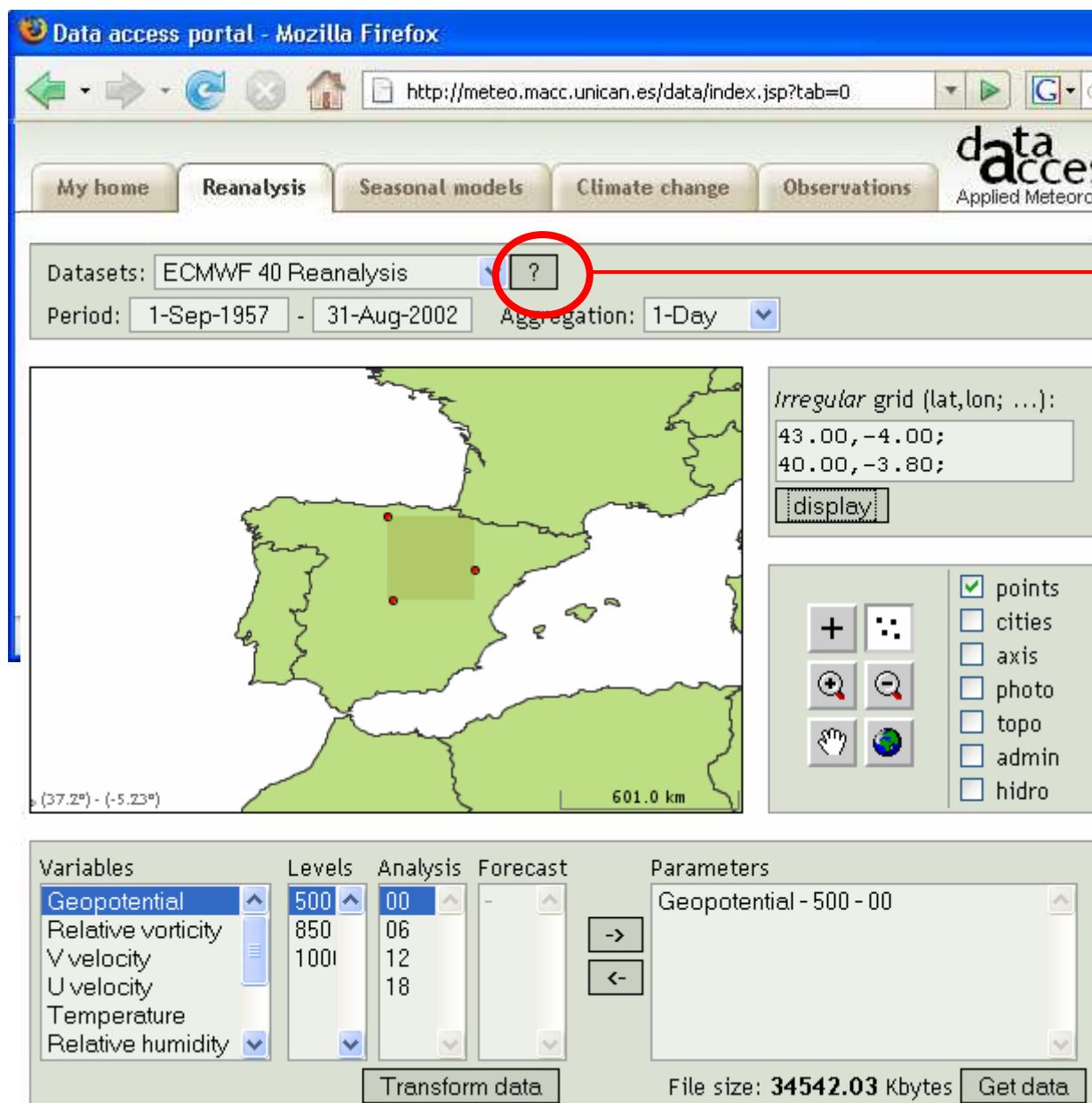
 http://localhost:9380 - D

ECMWF 40 years Reanalysis

Characteristics of the data:

- 60,Potential Vorticity,PV
- 129,Geopotential,Z
- 130,Temperature,T
- 131,U velocity,U
- 132,V velocity,V
- 133,Specific humidity,Q
- 136,Total Column Water,TCW
- 137,Total Column Water Vapou
- 138,Relative vorticity,VO
- 142,Large Scale Precipitation,L
- 143,Convective Precipitation,Cf
- 151,MSLP,MSL
- 155,Divergence,D
- 157,Relative humidity,R
- 165,10m E-Wind Component,1(
- 166,10m N-Wind Component,1(
- 167,2m Temperature,2T
- 168,2m Dew Point,2D

**1000, 925, 850, 700, 500, 30
00, 06, 12, 18 , 24 UTC
1.125°x1.125° resolution**



Data Access: s2d & acc

<http://www.meteo.unican.es>

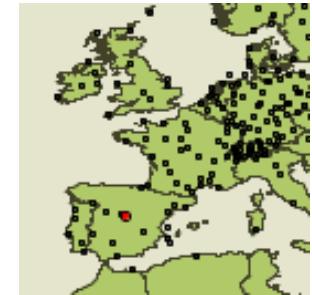
Two screenshots of the Data access portal interface are shown side-by-side.

Left Screenshot: The interface for the DEMETER Global project. The "Project" dropdown shows "DEMETER Global". The "Period" dropdown shows "1958 - 2001". The "Aggregation" dropdown shows "1-Day". Below the map, the "Variables" section lists "Geopotential", "Total Precipitation", "Maximum Temperature", "Minimum Temperature", "Temperature", and "Surface Temperature". The "Levels" section shows "500" and "850". The "Analysis" section shows "Feb", "May", "Aug", "Nov". The "Forecast" section shows "Mar", "Apr", "May", "Jun", "Jul".

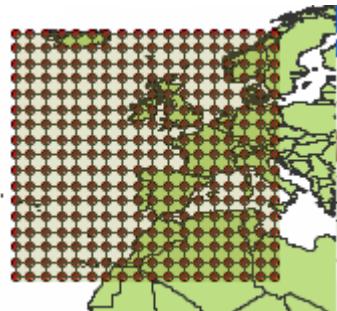
Right Screenshot: The interface for the CNCM3 project. The "Project" dropdown shows "CNCM3". The "Scenario" dropdown is open, showing options: "SRA1B", "SR1B", "SRA2", "20C3M_1", and "20C3M_2". The "Period" dropdown shows "2000 - 2100". The "Aggregation" dropdown shows "1-Day". To the right of the map, there is a "Regular grid" configuration panel with "Lon: -180.00 - 180.00", "Lat: -90.00 - 90.00", and "Lon - Lat res: 1.00 - 1.00". A legend on the right lists icons for "points", "cities", "axis", "photo", "topo", "admin", and "hidro". The "Variables" section lists "Geopotential", "V velocity", "U velocity", "Temperature", "Relative humidity", and "Specific humidity". The "Levels" section shows "50", "100", "200", and "300". The "Analysis" section shows "Jan", "Feb", "Mar", "Apr", "May", "Jun". The "Forecast" section shows "Jan", "Feb", "Mar", "Apr", "May", "Jun". The "Parameters" section is empty. At the bottom, it says "File size: 0 Kbytes" and "Get data".

Statistical Downscaling Portal

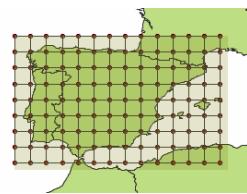
Problem: Local climate change prediction for Madrid (Spain): *maximum temperature*



Goal: Provide **daily local values for the summer season june-august 2010-2040** in a suitable format (e.g., text file, or Excel file).



Regional zone



Local zone

Predictors

$(T(1000 \text{ mb}), \dots, T(500 \text{ mb});$
 $Z(1000 \text{ mb}), \dots, Z(500 \text{ mb});$
 $H(1000 \text{ mb}), \dots, H(500 \text{ mb}))$

$$X_n$$

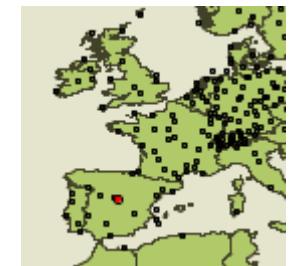
Downscaling Model

Regres, CCA, ...
 $Y_n = W^T X_n$

Precipitation
Temperature

$$Y_n$$

Predictands



This is the structure followed in the portal's design: predictors + predictand + downscaling method.

Demo... My Home

<http://www.meteo.unican.es>

The screenshot shows the 'My home' interface in Mozilla Firefox. The top navigation bar includes 'Archivo', 'Editar', 'Ver', 'Historial', 'Marcadores', 'Herramientas', and 'Ayuda'. The address bar shows the URL <http://meteo.macc.unican.es/ensembles/>. The main content area has tabs for 'home', 'logout', 'gutierjm', 'jobs info', and 'user manager'. A banner at the top right reads 'Web portal for statistical downscaling Applied Meteorology Group (INM & University of Cantabria)' with an 'ENSEMBLES' logo.

Zone manager: Shows a tree view of predictor details. A red box highlights the 'Predictor details' section, which includes fields like Creation date, Dataset, Start date, End date, Lon, Lat, Resolution, and Predictors. A circled 'Edit' icon is above this section.

Profile: Shows account and restriction details. A red box highlights the 'Databases' section, specifically the 'Reanalysis' subsection which lists ECMWF 40 Extended, ECMWF 40 Reanalysis, and NCEP/NCAR Reanalysis.

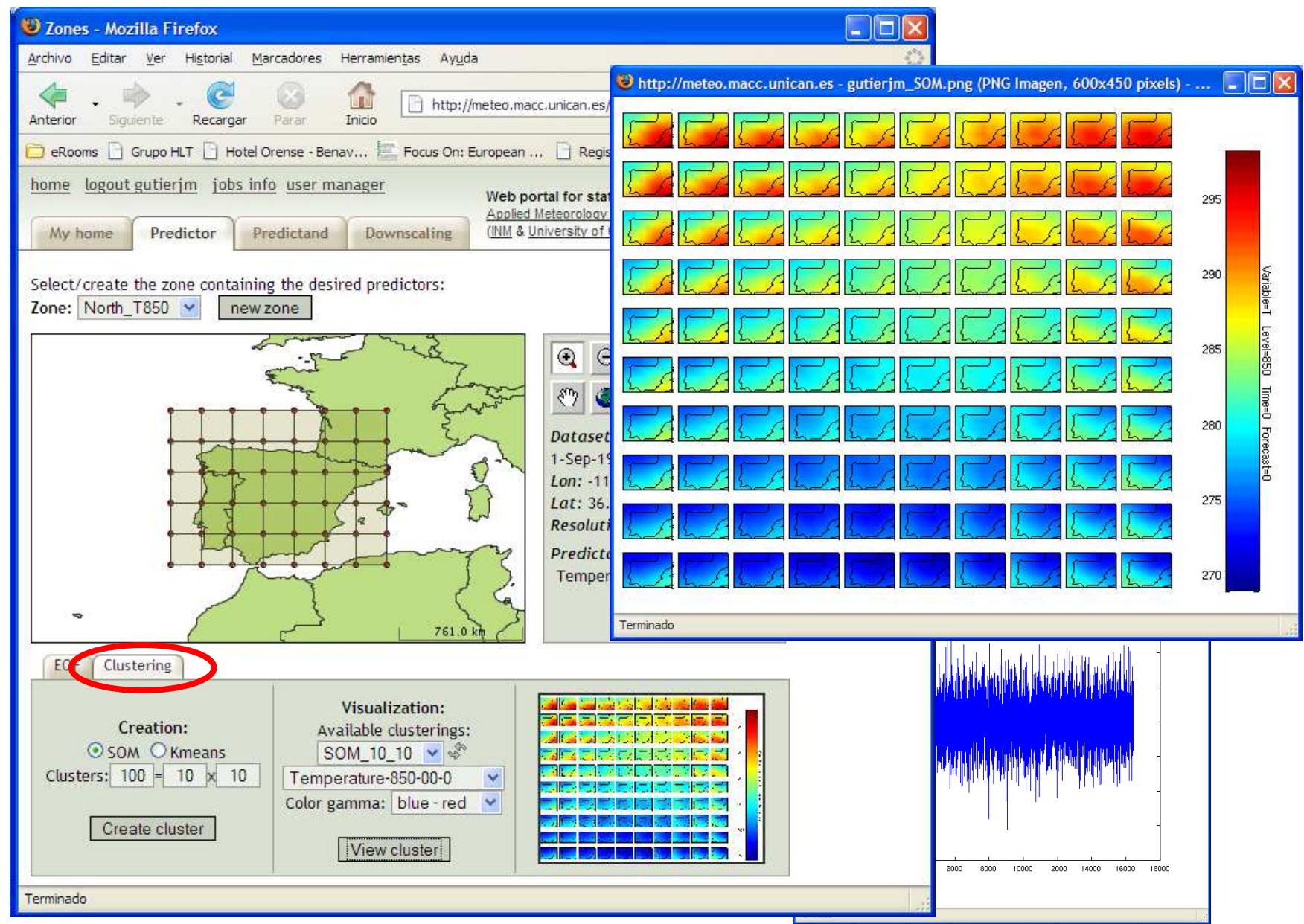
Jobs: A table showing job status. A red box highlights the first five rows of the table, which show entries for job IDs 1456 and 1455 with statuses like 'Finished', 'Running (100%)', 'Queued', 'Being queued', and 'Sent (job sent)'.

The “My Home” tab allows the user to explore:

1. The **zones** (pre-defined regions).
2. The **profile** with the account information.
3. The status of the **jobs**: *queued, running, finished.*

Demo... Predictors

<http://www.meteo.unican.es>



Demo... predictand

<http://www.meteo.unican.es>

Predictand - Mozilla Firefox

Archivo Editar Ver Historial Marcadores Herramientas Ayuda

home logout gutierjm jobs info user manager

Web portal for statistical downscaling
Applied Meteorology Group
(INM & University of Cantabria)

My home Predictor Predictand Downscaling

Select/create the predictands to downscale:

Zone: North_T850 → Predictand: **new predictand**

http://meteo.macc.unican.es - Predictand - Mozilla Firefox

New predictand for zone: North_T850

Data base: ECA Variable: Precip

Start date: 1-Jan-1900 End date: 31-Dec-2006 Step: 571.0 km

571.0 km

Precip
Minimum temperature
Maximum temperature
Mean temperature
Presure
Humidity
Cloud Cover
Sunshine
Snow depth

Country filter: none

Selected points info

New predictand: MadridTx save Upload user data

Terminado

Terminado

Terminado

Demo... Downscaling Method

<http://www.meteo.unican.es>

Screenshot of the Downscale - Mozilla Firefox interface showing the creation of a new downscaling method.

The main window shows the URL <http://meteo.macc.unican.es/ensembles/methods/easy>. The menu bar includes Archivo, Editar, Ver, Historial, Marcadores, Herramientas, and Ayuda. The toolbar includes Anterior, Siguiente, Recargar, Parar, and Inicio. The address bar shows the current URL. Below the toolbar, there are links for eRooms, Grupo HTL, Hotel Orense - Benav..., Focus On: European..., Register a group publ..., and NASA World Wind.

The navigation menu includes home, logout, gutierjm, jobs info, user manager, My home, Predictor, Predictand, and Downscaling. The Downscaling tab is active. The header also mentions "Web portal for statistical downscaling Applied Meteorology Group (INM & University of Cantabria)" and features an EU flag logo with the word "ENSEMBLES".

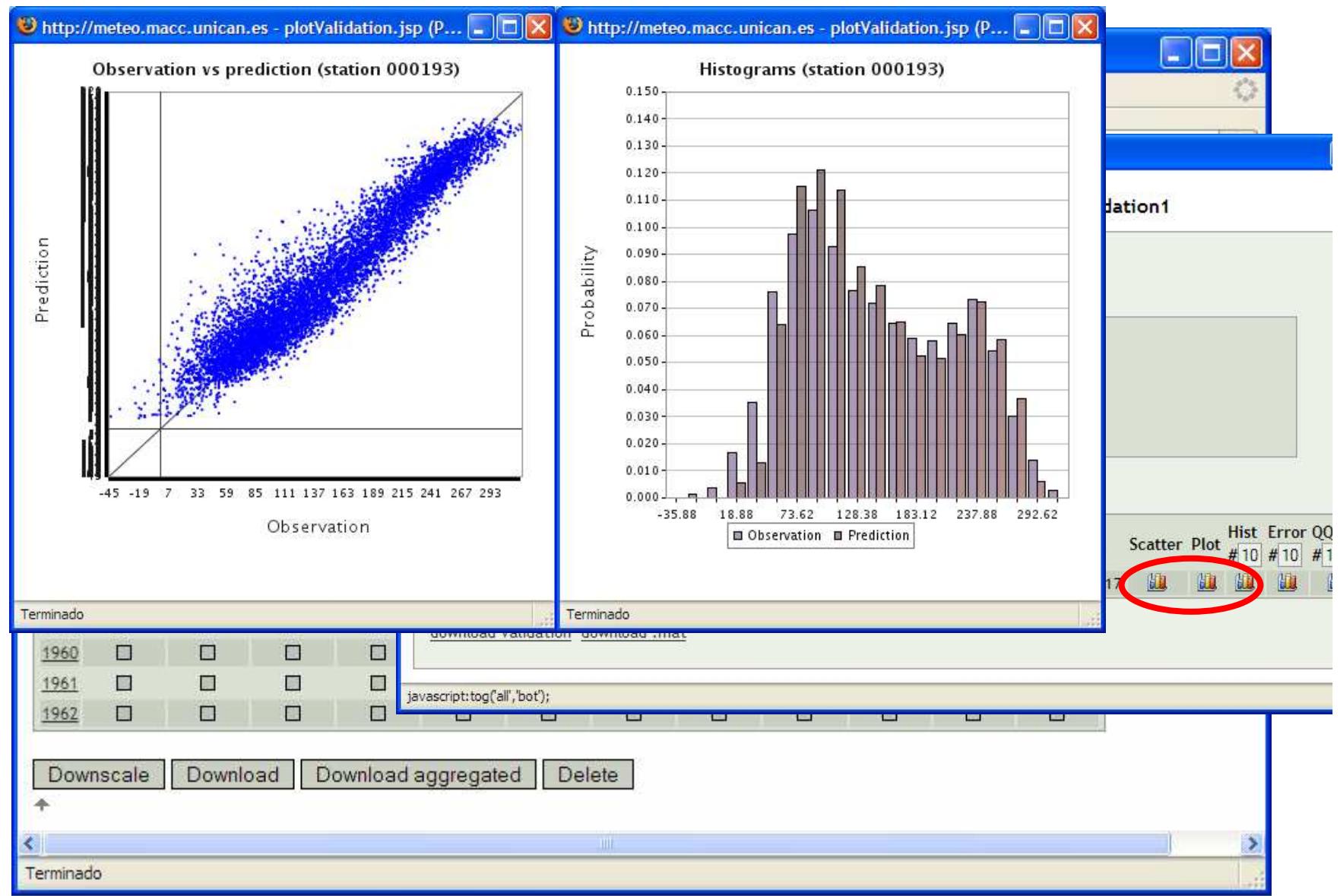
The main content area displays a message: "Select/create the downscaling method and the predictions to downscale: Zone: North_T850 → Predictand: MadridTX → Method: default (Analogs) [edit] [new method]". The "new method" button is circled in red.

Two sub-windows are shown side-by-side:

- New downscaling method:** This window shows the configuration for the "Analogs" method. It includes fields for "Nearest neighbours" (set to 25), "Inference method" (radio buttons for Mean, Dist. weighted mean, and Percentile, with Mean selected), and "Percentile (if inference is Percentile)" (set to 25). The "Downscaling name" field contains "new_method" and the "create" button is visible.
- New downscaling method:** This window shows the configuration for the "NN Local" method. It includes fields for "Available clusters" (set to SOM_10_10), "Feature selector" (set to none), and "Number of features" (set to 5). The "Downscaling name" field contains "new_method" and the "create" button is visible.

Demo... Validation

<http://www.meteo.unican.es>



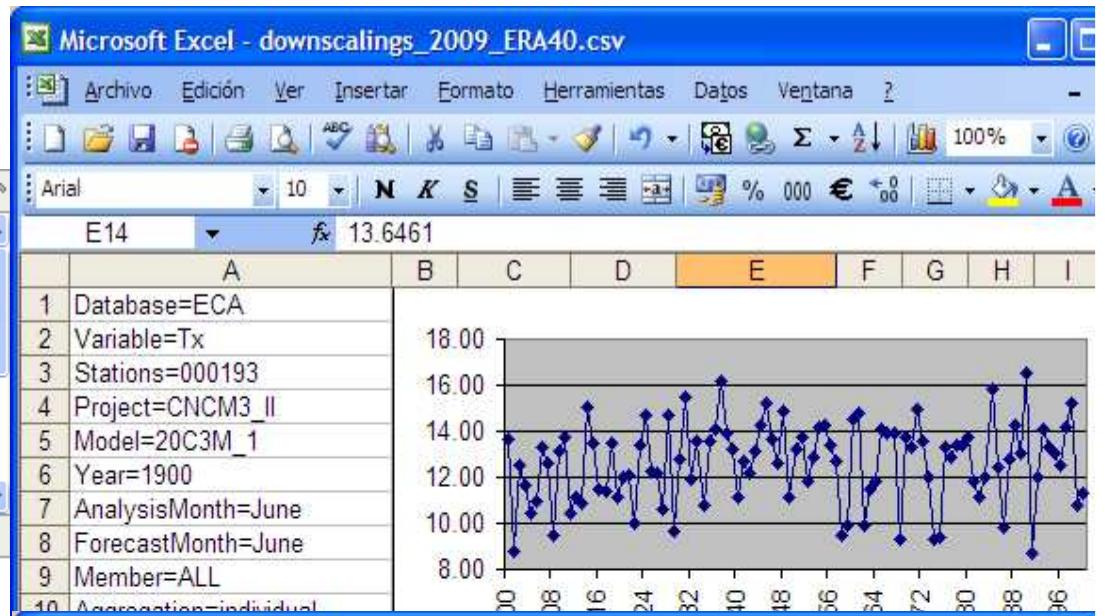
Demo... Regional Projection

<http://www.meteo.unican.es>

Demo...Time to Compute

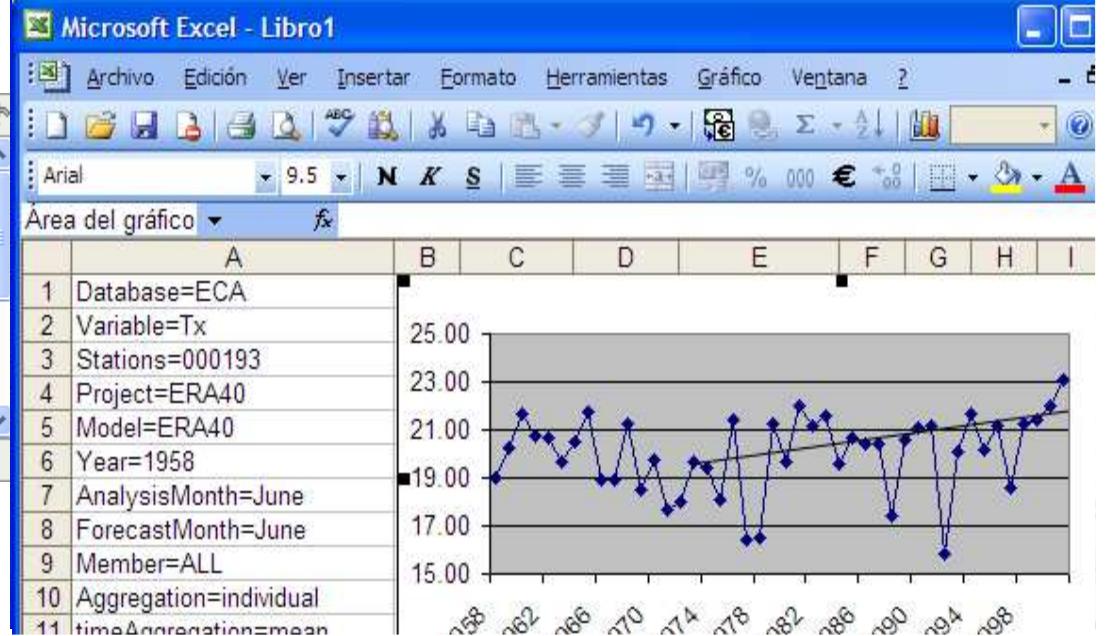
Scheduling the job

Jobs				
Id	Date	Status	Type	Where
1463	2007-10-02 19:04:48	Running	Downscaling	default
		kill this job		
	2007-10-02 19:07:25	→ Running		
	2007-10-02 19:04:49	→ Queued (16677.eela02.macc.unican.es)		
	2007-10-02 19:04:49	→ Being queued		
	2007-10-02 19:04:48	→ Sent (job sent)		
1462	2007-10-02 19:00:36	Finished	Downscaling	default
	2007-10-02 19:05:42	→ Finished		
Click on for a graphical report of jobs				
gutierrezm				



Five minutes later ...

Jobs				
Id	Date	Status	Type	Where
1463	2007-10-02 19:04:48	Finished	Downscaling	default
	2007-10-02 19:09:14	→ Finished		
	2007-10-02 19:07:25	→ Running		
	2007-10-02 19:04:49	→ Queued (16677.eela02.macc.unican.es)		
	2007-10-02 19:04:49	→ Being queued		
	2007-10-02 19:04:48	→ Sent (job sent)		
1462	2007-10-02 19:00:36	Finished	Downscaling	default
	2007-10-02 19:05:42	→ Finished		
Click on for a graphical report of jobs				
gutierrezm				



Current Status

- Support for users in ENSEMBLES project.
- Data access for Reanalysis, Seasonal2Decadal and Climate Change models.
- Users can use common observations datasets or upload their own data for downscaling.
- Data access control based on user authentication and authorization.
- User can choose predictors, predictands and transfer function to be used in the downscaling process.
- Quality assessment of the downscaling.
- Download the downscaled data.

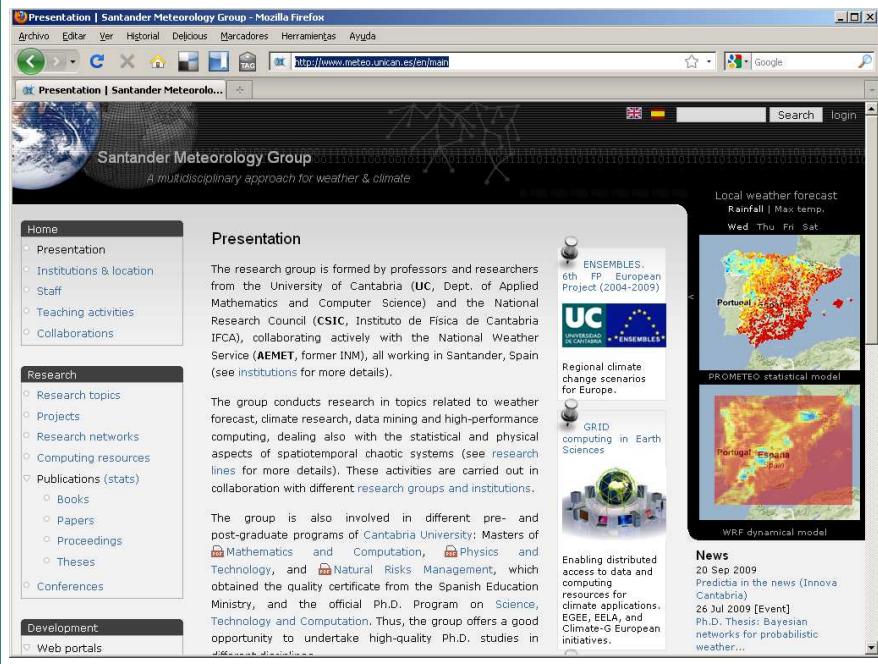
Future actions

- End-user tool for new projects and applications:
 - **QWeCI**: Quantifying Weather and Climate Impacts on Health in Developing Countries
 - **FUME** (Forest fires under climate, social and economic changes in Europe, the Mediterranean and other fireaffected areas of the world)
 - **South America and India** users
- Data access and storage: towards remote accessing of datasets based on **OPeNDAP**. Reanalysis, S2D & ACC simulations.
- Incorporate more statistical downscaling tools.
- Full integration with on GRID technologies to provide more resources for new users. Collaboration with EGEE, EGI, SSC-ES, EELA and others initiatives
- Integrate catalog capabilities for model and observation data. METAFOR, Climate-G initiatives (see tomorrow`s presentations)

<http://www.meteo.unican.es>

Thank you !!!

Please, for more information visit us at
<http://www.meteo.unican.es>
or e-mail us at
meteo@unican.es



The screenshot shows the homepage of the Santander Meteorology Group. The header features a globe and the text "Santander Meteorology Group" with the subtitle "A multidisciplinary approach for weather & climate". The main menu includes "Home", "Presentation", "Research", "Development", and "Collaborations". The "Research" section is currently active, showing sub-options like "Research topics", "Projects", "Research networks", "Computing resources", and "Publications (stats)". Below this, there's a "Development" section for "Web portals". The right side of the page displays several research projects and models: "ENSEMBLES: 6th FP European Project (2004-2009)", "Regional climate change scenarios for Europe", "GRID computing in Earth Sciences", "Enabling distributed access to data and computer resources for climate applications: EGE, EELA, and Climate-6 European initiatives.", and three maps titled "PROMETEO statistical model", "WRF dynamical model", and "Local weather forecast Rainfall | Max temp. Wed Thu Fri Sat". A news sidebar lists items from September 2009, such as "Predictia in the news (Innova Cantabria)" and "Ph.D. Thesis: Bayesian networks for probabilistic weather...".

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Instituto de Física de Cantabria



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INTELLIGENT DATA SOLUTIONS

